

## Diseases of the Circulatory System Before and after the Family Health Program, Londrina, Paraná

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### Abstract

**Background:** The reduction in morbidity and mortality rates from diseases of the circulatory system (DCS) is one of the greatest challenges in primary care, and the implementation of the Family Health Program provides access to the multisectoral and integrated measures required for dealing with these diseases.

**Objective:** To analyze DCS mortality and hospitalization rates before and after the implementation of the Family Health Program, in Londrina, Paraná.

**Methods:** This was an ecological study, comparing DCS, cerebrovascular disease (CbVD) and ischemic heart disease (IHD) mortality rates and hospitalization rates by the SUS, in residents of Londrina, in two 4-year periods: 1997 to 2000, and 2002 to 2005. The data were obtained from the Mortality Information System and the Hospital Information System of the SUS. The ratios between the rates were calculated for both periods at 95% confidence interval.

**Results:** The DCS was the first cause of death in the city, in both quadrennia. The CbVD and IHD accounted for more than 63% of DCS deaths. In comparing the two quadrennia, there was a reduction in CbVD mortality rates, which was significant only for subjects over 59 years, in both genders, and the hospitalization rates increased by 10%. For IHD, no significant change occurred in mortality rates, and there was a 40% increase in hospitalization rates.

**Conclusion:** The significant reduction only in CbVD mortality in the elderly suggests the need for expanding health assistance coverage to different population groups and the development of preventive and health promotion measures. (Arq Bras Cardiol 2009; 93(6):597-601)

**Key Words:** Cardiovascular diseases / mortality; morbidity; program evaluation.

### Introduction

The technological and industrial revolution changed the morbidity and mortality profiles of the population, with a prevalence of diseases and deaths caused by non-transmissible chronic diseases (NTCD), resulting in high costs to society due to high mortality and early disability<sup>1</sup>.

In Latin America and the Caribbean, NTCD is the main cause of death, and the most important diseases are those of the circulatory system - DCS, cancers and diabetes mellitus<sup>2</sup>. In Brazil, in 2005, the DCS were responsible for 31.5% of deaths. Among these, cerebrovascular disease (CbVD) was the first cause of death, followed by acute myocardial infarction, which is the main disease among the group of ischemic heart diseases (IHD). In 2006, the DCS represented 10.1% of the total number of hospitalizations<sup>3</sup>.

Both CbVD and IHD risk factors are well established. The Framingham study was among the first ones to demonstrate

that hypertension, high cholesterol, obesity, diabetes mellitus, lack of physical activity and smoking habit are risk factors that are strongly related to the development of heart diseases and cerebrovascular diseases<sup>4</sup>. After this one, several other studies confirmed this association<sup>5-7</sup>.

All these risk factors are related in some way; therefore, the implementation of health care models that incorporate several strategies to prevent and/or control these factors, individually and collectively, is of fundamental importance in order to reduce DCS morbidity and mortality. This is, currently, one of the greatest challenges in basic health assistance<sup>8</sup>.

The implementation of the Family Health Strategy as a policy priority for primary care, due to its configuration and work process, includes the most favorable conditions for accessing the integrated and multisectoral measures required for dealing with the DCS<sup>1</sup>.

Given the importance of the DCS in the nosological framework in the country and the world, and considering the role of the family health teams in identifying and controlling major DCS risk factors, the purpose of this study is to analyze mortality rates and hospitalization rates by SUS, before and after the implementation of the Family Health Program, in Londrina, Paraná.

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## Methods

This was an ecological study, which compared mortality rates and hospital admissions for DCS, IHD and CbVD among individuals residing in the municipality of Londrina, in two four-year periods: from 1997 to 2000, and from 2002 to 2005, respectively before and after the implementation of the Family Health Strategy. The year 2001 was excluded because it was the year of the implementation of this strategy in the urban area of the municipality.

The city of Londrina is situated in the northern region of Paraná State. In 2005, it had a population of 488 287 inhabitants<sup>9</sup>. In the same year, its network of primary care consisted of 54 health care units, with 102 teams linked to the Family Health Program, with a coverage of over 70% of the population of the municipality, especially from remote areas with greater epidemiological and social risk<sup>10</sup>.

The mortality and hospitalization data were obtained from the data bank of the Mortality Information System (SIM) and the Hospital Information System of the Unified Health System (SIH/SUS). These data banks were made available to us by the Department of Information and Computer Science of SUS (DATASUS), an agency which is under the responsibility of the Executive Secretary of the Ministry of Health<sup>11</sup>. The population data source was the Brazilian Institute of Geography and Statistics (IBGE); the population count for 1996 and the population estimates for 1997-1999, the 2000 Census (first quadrennium) and the Census estimates for 2000 to 2002-2005 (second quadrennium)<sup>9</sup>.

The data collection and classification conducted by the Information Systems of the Ministry of Health on morbidity and mortality from diseases of the circulatory system were based on the International Statistical Classification of Diseases and Related Health Problems - Tenth Revision of the International Classification of Diseases (ICD-10), Chapter IX<sup>12</sup>. For the number of admissions in 1997, we used the ICD-9 (Chapter VII), which was the classification in force at that time. The DCS were grouped by the codes ICD-9 390 to 459 and ICD-10 I00 to I99. The CbVD were grouped by the codes ICD-9 430 to 438 and ICD-10 I60 to I69. And the IHD were grouped by the codes ICD-9 410 to 414 and ICD-10 I20 to I25.

The data were transferred to an Excel spreadsheet, and specific rates were calculated according to the variables gender, age, cause of death and hospitalization. Gross rates of mortality and hospitalization for DCS, CbVD and IHD were used instead of standardized rates, considering the similarity in the population structure of the municipality in both periods. According to Laurenti et al<sup>13</sup>, standardization is a resource to be used in the comparison of populations with different age structures.

For comparison of rates before and after the implementation of the Family Health Program, we calculated the ratios of mortality and hospitalization at the 95% confidence interval for the referred causes, using as a reference the value corresponding to the 1997-2000 quadrennium. To calculate the confidence interval, we used the "statcalc" of the program Epi Info, Version 3.4.1. Considering the Family Health Strategy as an intervention, ratios below 1, including the confidence interval, expressed a statistically significant reduction in disease

occurrence rates in the second period.

The research project was submitted to the Committee of Ethics in Research involving Human Subjects, of the Universidade Estadual de Londrina, and it was examined and approved under the recommendation 201/06, on August 7<sup>th</sup>, 2006.

## Results

The DCS was the first cause of death in the city of Londrina in both quadrennia of the study, and they accounted for 3262 deaths in the first period, and for 3389 deaths in the second period. Among the DCS, the CbVD were the most prevalent (40.31% of the DCS in the first period and 37% in the second), followed by IHD (25.1% and 26.82% respectively). Altogether, in both periods, CbVD and IHD accounted for approximately 65% of the DCS deaths. Despite the reduction in DCS mortality rate in the second period, from 188.9 to 179.3/100,000 inhabitants, this reduction was not significant (ratio = 0.95, 95%CI: 0.90-1.00).

As for hospital admissions for DCS, the rate of hospitalization remained unchanged in both periods (ratio = 1.00, 95% CI: 0.97-1.02). The CbVD were responsible for 9.6% and 10.7% of total admissions for DCS in the first and second periods, respectively, but the DCS percentage increased significantly in the second period, from 19.7% to 27.1 %.

Table 1 shows the CbVD mortality and hospitalization rates. There was a reduction in mortality rates (ratio = 0.87, 95%CI: 0.81-0.94), but there was a 10% increase in hospitalization rates in the second period (ratio = 1.10, 95% CI: 1.03-1.19), both statistically significant.

When stratifying by gender, there was a significant reduction in mortality rates for both men and women; however, in the stratification by age, this reduction was significant only in the group of individuals over 60 years, in both genders.

As to the CbVD hospitalization rates, we observed a significant increase among men. In women, a reduction was observed in all age groups, although it was not significant. The CbVD mortality and hospitalization rates were higher in males. The male/female mortality ratio has remained relatively stable, rising from 1.3 in the first period to 1.4 in the second period. In regard to hospitalization, there was a significant increase in the male/female ratio, which rose from 1.2 to 1.6, in the second period.

Table 2 shows that, for the IHD, there was no significant change in mortality rate between the periods (ratio = 1.01, 95%CI: 0.92-1.12). Slight and not significant changes were observed in gender specific mortality rates. Among men, there was a little increase, especially in the younger group (30 to 45 years). And among women, there was a reduction in all age groups.

As to the hospitalization rates, there was a significant increase in the second quadrennium, with a 40% increase in the rate (ratio = 1.40, 95% CI: 1.31-1.44). This increase was homogeneous in both genders and in all groups. However, it was in the 45-59 and the 60+ age groups that the increase was statistically significant.

Also for the IHD, mortality and hospitalization rates were

**Table 1 – Mortality and hospitalization rates by the SUS for cerebrovascular disease (per 100,000 inhab.) By gender and age. Londrina - Paraná, 1997-2000 and 2002-2005**

Rate	1997 - 2000	2002 - 2005	Ratio 2002- 2005/ 1997-2000 CI (95%)	
<b>Mortality</b>	76.1	66.3	0.87 [0.81: 0.94]*	
	87.5	77.0	0.88 [0.79: 0.98]*	
Male	30 to 44	15.6	15.2	0.97 [0.59: 1.62]
	45 to 59	82.1	94.9	1.16 [0.88: 1.52]
	60 +	886.0	682.0	0.77 [0.69: 0.86]*
Female		65.5	56.4	0.86 [0.77: 0.97]*
	30 to 44	10.9	7.3	0.67 [0.36: 1.26]
	45 to 59	46.4	45.8	0.99 [0.69: 1.41]
	619.6	475.5	0.77 [0.68: 0.87]*	
<b>Hospitalization</b>	78.1	86.7	1.10 [1.03: 1.19]*	
	85.7	106.7	1.25 [1.13: 1.37]*	
Male	30 to 44	37.2	43.2	1.16 [0.85: 1.59]
	45 to 59	169.8	203.2	1.20 [0.99: 1.45]
	60 +	635.6	719.5	1.13 [1.00: 1.28]*
Female		70.9	66.9	0.73 [0.85: 1.05]
	30 to 44	31.2	22.8	0.73 [0.51: 1.05]
	45 to 59	109.8	100.5	0.91 [0.72: 1.16]
	488.0	437.2	0.90 [0.78: 1.03]	

\*Statistically significant difference.

higher in males. As to the mortality rates, the male/female ratio rose from 1.5 in the first period to 1.7 in the second. As to the hospitalization rates, the male/female ratio was reduced from 1.5 in the first period to 1.4 in the second.

## Discussion

In reference to the design of ecological studies, according to Almeida Filho and Rouquayrol<sup>14</sup>, only recently the logical and methodological bases of this type of study have begun to be reviewed, and for the first time the subject has earned the attention of a chapter in the current most important Epidemiology textbook. In the context of epidemiology, ecological studies have gone through a period of intense devaluation, being relegated to the status of a purely descriptive approach, with little analytical power.

According to Morgenstern<sup>15</sup>, the ecological effects are particularly relevant when the objective of the research is to evaluate interventions in the population such as a new program, policy or legislation. However, some of the limitations mentioned by several authors<sup>15-17</sup> should be considered in the analysis of the results of this study. The first concerns the quality of information and the second concerns the difficulty in the control of confounding factors.

As to the information used, the data collected from the

**Table 2 – Mortality and hospitalization rates by the SUS for ischemic heart disease - DCS (per 100,000 inhab.). By sex and age. Londrina - Paraná, 1997-2000 and 2002-2005**

Rate	1997 - 2000	2002 - 2005	Razão 2002- 2005/ 1997-2000 IC (95%)	
<b>Mortality</b>	47.4	48.1	1.01 [0.92: 1.12]	
	57.2	60.7	1.06 [0.94: 1.20]	
Male	30 to 44	18.9	23.1	1.22 [0.79: 1.90]
	45 to 59	96.7	95.7	0.99 [0.76: 1.28]
	60 +	486.2	474.3	0.98 [0.84: 1.13]
Female		38.3	36.3	0.95 [0.82: 1.10]
	30 to 44	5.2	3.0	0.58 [0.22: 1.49]
	45 to 59	48.0	32.8	0.68 [0.47: 1.00]
	334.0	308.0	0.92 [0.78: 1.09]	
<b>Hospitalization</b>	160.6	220.6	1.40 [1.31: 1.44]*	
	195.5	257.2	1.32 [1.24: 1.40]*	
Male	30 to 44	88.9	100.7	1.13 [0.92: 1.39]
	45 to 59	509.3	685.0	1.35 [1.21: 1.50]*
	60 +	1325.4	1549.2	1.17 [1.07: 1.27]*
Female		127.4	186.1	1.46 [1.36: 1.58]*
	30 to 44	35.5	38.3	1.08 [0.79: 1.47]
	45 to 59	296.1	367.6	1.24 [1.09: 1.42]*
	851.8	1223.9	1.44 [1.31: 1.58]*	

\*Statistically significant difference.

municipality of Londrina, with a low proportion of ill-defined causes observed after the implementation, in the mid-1990s, of the Center for Information on Mortality (NIM), which checks all death certificates and seeks to confirm the true causes of death<sup>18</sup>, suggest good quality data. It is noteworthy that ill-defined causes account for less than 1.7% of deaths in the periods covered by the study<sup>19</sup>.

The significant differences found in rate values cannot be analyzed as resulting exclusively from the intervention (Family Health Program), since the study did not involve the controlling of confounding factors. Therefore, we could only suggest hypotheses about the possible influence of the implemented strategy on the levels of morbidity and mortality from cardiovascular diseases, which should be better explored with the use of other designs, such as case-control studies.

As to the results, this study identified a reduction by 5.1% in the DCS mortality rate in the period of 2002 to 2005, when compared to the period of 1997 to 2000. The group of causes responsible for this reduction was the CbVD, which accounted for a 12.9% reduction in the rates. These results follow the trend of decline in the prevalence of DCS and CbVD that occurred in the Southern region of the country<sup>20</sup> and in some other countries like Japan, Australia, the United States and Western European countries, since the 1950s<sup>21</sup>. The CbVD mortality rates observed in the municipality, in

the second period, were lower than those observed in the Southern region of the country in 2001, in both genders and in all age groups<sup>22</sup>.

Several studies have demonstrated that the CbVD show a significant increase in mortality with age, reaching very high values in individuals aged above 60 years<sup>22-24</sup>, and this has also been confirmed by this study in the city of Londrina. A significant reduction in CbVD mortality rates leads us to infer that the care provided by the Family Health Program in the municipality, which has hypertension as a priority area of the program for the action of health care teams (through the distribution of medications, blood pressure control, and clinical and laboratory monitoring of patients), has contributed to the reduction in mortality rates among women and the elderly. It is noteworthy that the hypertension control measures conducted by the Family Health teams involve these two main groups: women and the elderly, as described by Sousa et al<sup>25</sup> in the implementation of this strategy in a small city of the interior of Paraná.

In the study conducted by Abreu et al<sup>26</sup>, a reduction in mortality from CbVD was observed in Brazil, from 1993 to 2002. The authors attributed this reduction, in part, to changes in health services supply and access that occurred in the country in that period. According to a study conducted by Collins et al<sup>27</sup>, the CbVD can be avoided in up to 42% of the cases through an adequate hypertension control. However, it should also be taken into account that the ease of access to hospitalization may have contributed to the reduction in mortality from this cause.

As to the IHD, the behavior of the disease in the city, which showed similarities in rate values in both study periods, differs from the decrease trend observed in the U.S., Western Europe, Japan and Latin America since the late 60s, and in the South and Southeast regions of Brazil, since the 1980s<sup>28</sup>. According to Lotufo<sup>28</sup>, mortality from IHD in Brazil is not uniform.

Regarding hospitalization in Londrina, the increase in rates may be consequent to the expansion in access to hospital care, reflecting the regulation of pre-hospital and hospital care, and the implementation of the SAMU and the city central agency of hospital beds management, in the early 2000s. Another issue to be considered in the increase mentioned refers to the technological advances in diagnostic and interventional treatment for this disease (coronary artery bypass and angioplasty) which occurred in recent years. According to Oliveira et al<sup>29</sup>, in a study conducted in the state of Rio de Janeiro, there was a significant increase in admissions for IHD, with a concomitant increase in high-complexity procedures in admissions.

Despite the increase in hospitalization, there was no reduction in mortality from IHD. In this regard it should be emphasized that there is no consensus on what type of medical intervention has greater impact on the occurrence of the disease<sup>26</sup>. In the study "INTERHEART," conducted in 52 countries, assessing the effect of risk factors for myocardial infarction, it was observed that dyslipidemia, smoking habit, hypertension, diabetes, abdominal obesity, low intake of fruits and vegetables, the use of alcohol and lack of regular physical activity are the most important risk factors in all countries, in both genders and all ages. These nine factors accounted for

90% of the attributable risk in men and 94% in women<sup>30</sup>.

This finding reinforces the multifactorial nature of cardiovascular diseases and the inadequacy of the interventionist actions and of those that primarily focus on the control of hypertension in the elderly. It should be taken into account that, in the etiology of the IHD, an adequate control of hypertension may decrease the occurrence of IHD in 14% of cases<sup>27</sup>. These aspects indicate the need for refocusing health care procedures and expanding health care coverage, with preventive and health promotion approaches that address changes in lifestyle.

We must now ponder what preventive and health care strategies should be adopted by the Family Health teams, aiming at reducing deaths from IHD and CbVD in other age groups and particularly in the male population. In this aspect, it is essential that the various initiatives to reduce the impact of noncommunicable diseases in the Brazilian population, as those that have been proposed by the Ministry of Health -ranging from the screening of diabetes at national level, the implementation of campaigns on hypertension, the implementation of protocols for aggressive management of dyslipidemia in coronary disease patients<sup>31</sup> -also have suitable conditions for implementation by local teams.

It should be stressed that only recently have strategies to promote health been adopted. The National Policy of Health Promotion, published in 2002 by the Ministry of Health<sup>32</sup>, made several notes, but this was not sufficient to start concrete actions in this area. A recent strategy, released in early 2008, by ministerial decree, was the establishment of Family Health Support Centers<sup>33</sup>, which operate on a multidisciplinary level, aiming to support the family health teams; if successful, it will be an important step in developing physical activity actions and promoting healthy eating habits and mental health habits, among others, which are clearly needful in dealing with these noncommunicable diseases.

Although the present analysis was based on secondary and aggregate data, the results showed a reduction in mortality rates from diseases of the circulatory system in the municipality, after the implementation of the Family Health Strategy, as a result of a reduction in mortality from cerebrovascular diseases, especially in the elderly. This reflects, to some extent, the impact of the investment in hypertension control in the prevention of cerebrovascular events. However, the maintenance of mortality levels and the increase in hospitalizations, both for CbVD and IHD among non-elderly adults, suggest the need for a deeper analysis at local level, so as to verify the extent to which the measures have reached different population groups, especially those in the labor market. Also worthy of concern is the higher morbidity and mortality observed in male patients, especially considering that further progress in promoting cardiovascular health depends largely on the capacity to include individuals which are traditionally left out of the health care system, with emphasis on basic health care. The epidemiological indicators should not be calculated only in response to government demands for transfer of resources, but they must be embedded in

the concept of surveillance and systematic monitoring, in order to support decision making at all levels of the health care system.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

## References

1. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Prevenção clínica de doença cardiovascular, cerebrovascular e renal crônica. Brasília; 2006. (Cadernos de Atenção Básica, 14).
2. Malta DC, Morais Neto OL. Introdução. In: Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Guia metodológico de avaliação e definição de indicadores: doenças crônicas não transmissíveis e Rede Carmen. Brasília; 2007. p. 18-20.
3. Ministério da Saúde [homepage na internet]. Caderno de Informações de Saúde, 2007. [acesso em 2007 Set 9]. Jul. Disponível em: [http://tabnet.datasus.gov.br/tabdata/cadernos/BR/Brasil\\_GeralBR.xls](http://tabnet.datasus.gov.br/tabdata/cadernos/BR/Brasil_GeralBR.xls).
4. Sytkowsky PA, Kannel WB, D'Agostino RB. Changes in risk factors and the decline in mortality from cardiovascular disease. The Framingham heart Study. *N Engl J Med*. 1990; 322: 1635-41.
5. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R, Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet*. 2002; 360: 1903-13.
6. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004; 364: 937-52.
7. Avezum A, Piegas LS, Pereira JC. Fatores de risco associados com infarto agudo do miocárdio na região metropolitana de São Paulo: uma região desenvolvida em um país em desenvolvimento. *Arq Bras Cardiol*. 2005; 84(3): 206-13.
8. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Hipertensão arterial sistêmica para o Sistema Único de Saúde. Brasília; 2006. (Cadernos de Atenção Básica, 16).
9. Instituto Brasileiro de Geografia e Estatística. (IBGE). [homepage na internet]. População [acesso em 2007 Ago 16]. Disponível em: <http://www.ibge.gov.br/home/estatistica/populacao/estimativa2005/estimativa.shtm>.
10. Prefeitura do Município de Londrina. Secretaria Municipal de Saúde. Plano Municipal de Saúde 2006-2007. Londrina; 2007.
11. Ministério da Saúde [homepage na internet]. DATASUS. Informações de saúde. Morbidade e informações epidemiológicas. [acesso em 2009 abr 18]. Disponível em: <http://w3.datasus.gov.br>
12. Organização Mundial da Saúde. Classificação estatística internacional de doenças e problemas relacionados à saúde. 10ª ed. São Paulo: EDUSP; 1995.
13. Laurenti R, Melo Jorge MHP, Lebrão MI, Gotlib SLD. Estatísticas de saúde. 2ª ed. São Paulo: EPU; 2005.
14. Almeida Filho M, Rouquayrol MZ. Elementos da metodologia epidemiológica. In: Rouquayrol MZ, Almeida Filho M. (eds). Epidemiologia e saúde. 6ª ed. Rio de Janeiro: MEDSI; 2003. p. 149-77.
15. Morgenstern H. Ecologic studies. In: Rothman KJ, Greenland S. Modern epidemiology. Philadelphia: Lippincott Williams & Wilkins; 1998. p. 459-80.
16. Pereira MG. Epidemiologia teoria e prática. Rio de Janeiro: Editora Guanabara Koogan; 1995. p. 269-88.
17. Medronho RA. Estudos ecológicos. In: Medronho RA, Carvalho DM, Bloch KV, Luiz RR, Werneck GL. Epidemiologia. São Paulo: Editora Atheneu; 2005. p. 191-8.

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18. Andrade SM, Soares DA. Dados e informação em saúde: para que servem? In: Andrade SM, Soares DA, Cordon Junior L, (orgs.). Bases da saúde coletiva. Londrina: Ed. UEL; 2001. p. 161-81.
19. Ministério da Saúde [homepage na internet]. DATASUS. Informações de saúde. [Acesso em 2008 out 13]. Disponível em: <http://tabnet.datasus.gov.br>
20. Mansur AP, Souza MFM, Timerman A, Avakian SD, Aldrighi JM, Ramires JAF. Tendência do risco de morte por doenças circulatórias, cerebrovasculares e isquêmicas do coração em treze estados do Brasil, de 1980 a 1998. *Arq Bras Cardiol*. 2006; 87: 641-8.
21. Lessa I. Epidemiologia das doenças crônicas não-transmissíveis. São Paulo, Rio de Janeiro: HUCITEC; 1998. p. 97-114.
22. Souza MFM, Alencar APA, Malta DC, Moura L, Mansur AP. Análise de séries temporais da mortalidade por doenças isquêmicas do coração e cerebrovasculares, nas cinco regiões do Brasil, no período de 1981 a 2001. *Arq Bras Cardiol*. 2006; 87 (6): 735- 40.
23. Godoy MF, Lucena JM, Miquelin AR, Paiva FF, Oliveira DLQ, Augustin Junior JL, et al. Mortalidade por doenças cardiovasculares e níveis socioeconômicos na população de São José do Rio Preto, Estado de São Paulo, Brasil. *Arq Bras Cardiol*. 2007; 88 (2): 200-6.
24. Daniel E, Germiniani H, Nazareno ER, Braga SV, Winkler AM, Cunha CP. Tendência de mortalidade por doenças isquêmicas do coração na cidade de Curitiba – Brasil, de 1980 a 1998. *Arq Bras Cardiol*. 2005; 85(2): 100-4.
25. Sousa LB, Souza RKT, Scochi MJ. Hipertensão arterial e saúde da família: atenção aos portadores em município de pequeno porte na região sul do Brasil. *Arq Bras Cardiol*. 2006; 87: 496-503.
26. Abreu DMX, César CC, França EB. Relação entre as causas de morte evitáveis por atenção à saúde e a implementação do Sistema Único de Saúde no Brasil. *Rev Panam Salud Publica*. 2007; 21 (5): 282-91.
27. Collins R, Peto R, MacMahon S, Hebert P, Fiebach NH, Eberlein KA, et al. Blood pressure, stroke, and coronary heart disease. Part 2: Short-term reductions in blood pressure: overview of randomized drug trials in their epidemiological context. *Lancet*. 1990; 335: 827-38.
28. Lotufo PA. Epidemiologia das doenças isquêmicas do coração no Brasil. In: Lessa I. Epidemiologia das doenças crônicas não-transmissíveis. São Paulo, Rio de Janeiro: HUCITEC; 1998. p. 115-22.
29. Oliveira GMM, Klein CH, Silva NAS, Godoy PH, Fonseca TMP. Letalidade por doenças isquêmicas do coração no estado do Rio de Janeiro no período de 1999 a 2003. *Arq Bras Cardiol*. 2006; 86 (2): 131-7.
30. Rosengren A, Hawken S, Ounpuu S, Sliwa K, Zubaid M, Almahmeed WA, et al. Association of psychosocial risk factors with risk of acute myocardial infarction in 11 119 cases and 13648 controls from 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004; 364: 953-62.
31. Polaczky CA. Fatores de risco cardiovascular no Brasil: os próximos 50 anos! *Arq Bras Cardiol*. 2005; 84(3): 199-201.
32. Ministério da Saúde. Política Nacional de Promoção da Saúde. Brasília; 2002.
33. Ministério da Saúde. Portaria GM nº 154, de 24 de Janeiro de 2008. Cria os Núcleos de apoio à Saúde da Família - NASF. Diário Oficial da União 4 mar 2008; Seção 1(43):38-42.